Future Integrated Soldier Technology (FIST)

Programme Overview

NDIA Small Arms Symposium
12-15 May 2003

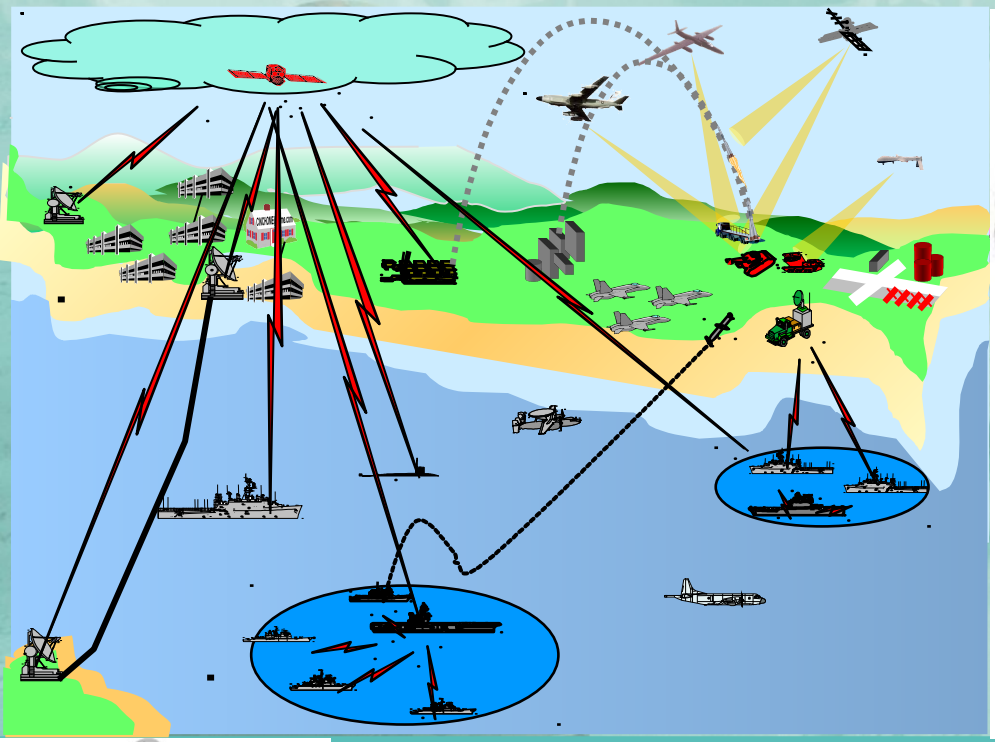
Lt Col (Retd) Keith M Cook MBE
Lethality Manager

FIST 1

- A £15M Assessment Phase (AP) programme to develop an Integrated soldier system for British forces.
- The 3 year AP programme will be followed by a £2.1B (£580 m Equipment procurement, £1.6B WLC) Development, Production and Support programme.
- AP contract awarded to Thales March 2003
- Programme started 7 April 2003
- First Production 2007.
- Initial Operating Capability 2009.
- 29000 Systems

Future INTEGRATED Soldier Technology

SDE
SYSTEM·DESIGN·EVALUATION·LTD



THALES FIST

FIST Prime Contract Management Office

THALES

Rapid Area Effects
Enhanced STA
Protection
Enhanced Situational Awareness (C4I)
Remote Sensors
MOVE
ENGAGE
Lethality
Mobility
Survivability

FIST Assessment Phase

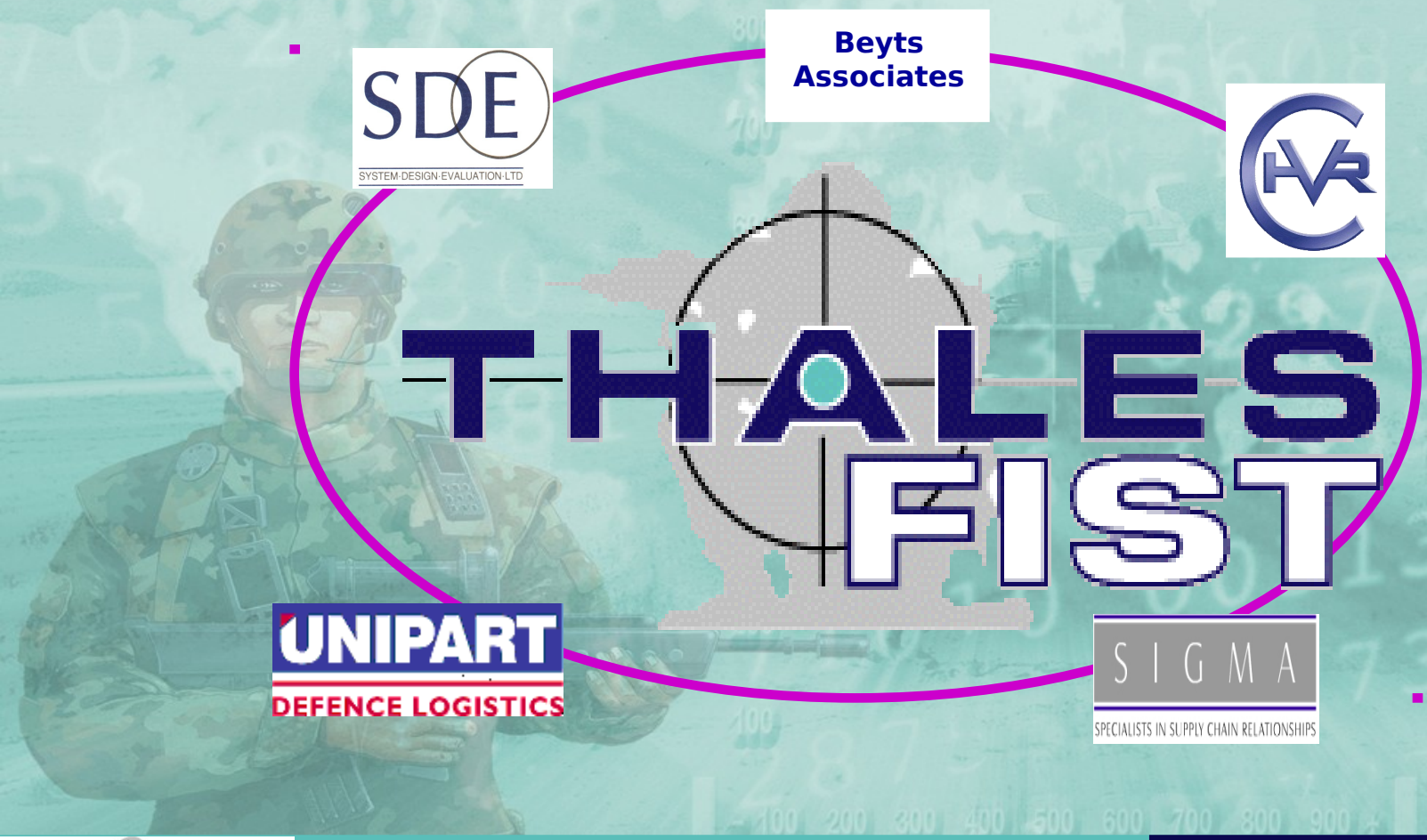
- Independent assessment of User Requirement
- Independent assessment of potential solutions
- Modelling, tests, evaluation and trials
- Business Case for Main Gate

What Does it Take?

- People
- Processes
- Partnering
- Plan

THALES FIST an Outstanding Team

Unsurpassed capability in all aspects of the FIST requirement

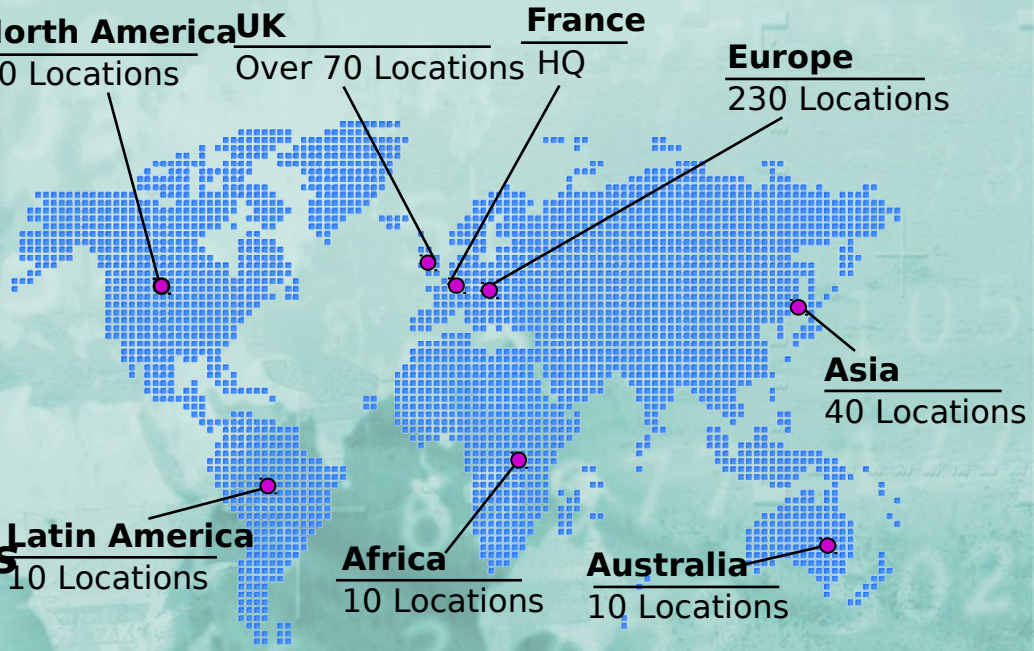


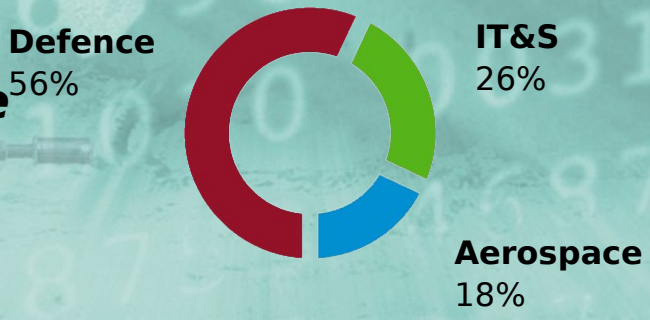
THALES WORLDWIDE

THALES

- Thales is one of the world's largest electronics groups
- ***65,000 people in 50 countries***
- ***global sales of 11.1 billion euros***

- ***Thales is organised into three business groups:***
  - ***defence***
  - ***aerospace***
  - ***IT & services***





THALES led the TD programme

THALES

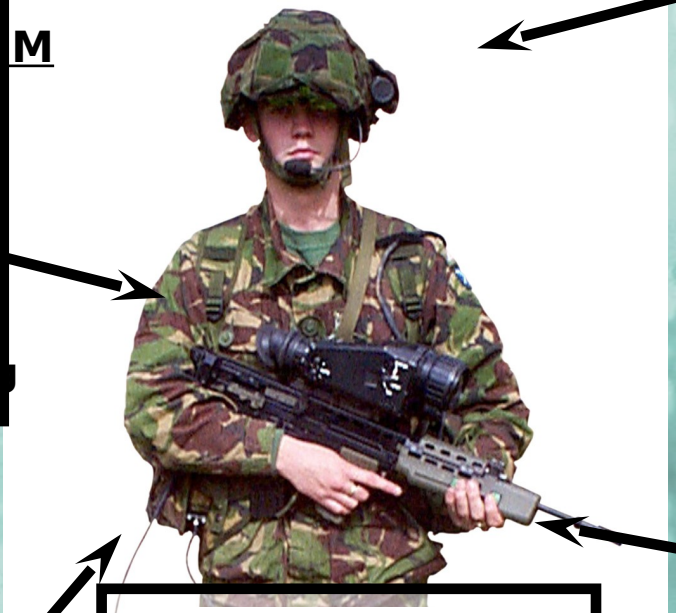
COMMANDER SUB SYSTEM

* Commander Computer
* Global Positioning System
* Digital Magnetic Compass
* *Commander Digital Radio*
* Torso Control Unit
* Ancillary Display
* Load Carriage & Packaging

THALES

HEAD SUB SYSTEM

* Helmet Platform
* Helmet Vision System
* Audio Comms System
* Helmet Electronics



THALES

TORSO SUB SYSTEM

* Load Carriage & Packaging
* *Personal Role Radio (PRR)*
* Rifleman Manager
* Video Processor Unit
* System Power Supplies
* Power Control Unit

THALES

MANAGEMENT

* PRIME
* System Design Authority
* MMI Design Authority

HK

WEAPON SUB SYSTEM

* *F2000IW, LSW, GLIW*
* *Weapon Control Unit*
* Thermal Weapon Sight
* Dual Waveband Sight
* IR Laser Range Finder
* IR Laser Aimer

THALES International Involvement

Country	Programme
• UK	FIST
• France	FELIN
• Germany	IdZ
• Netherlands	SMP
• Norway	NORMANS
• US	Land Warrior
• US	Objective Force Warrior
• Italy	Combattente
• Australia	Land 125
• South Africa	African Warrior
• Egypt	IESS

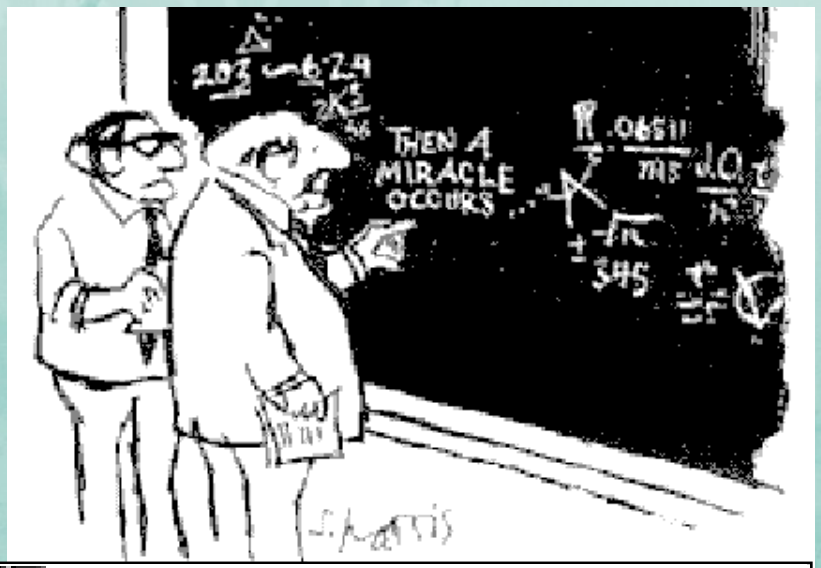
Related Activities

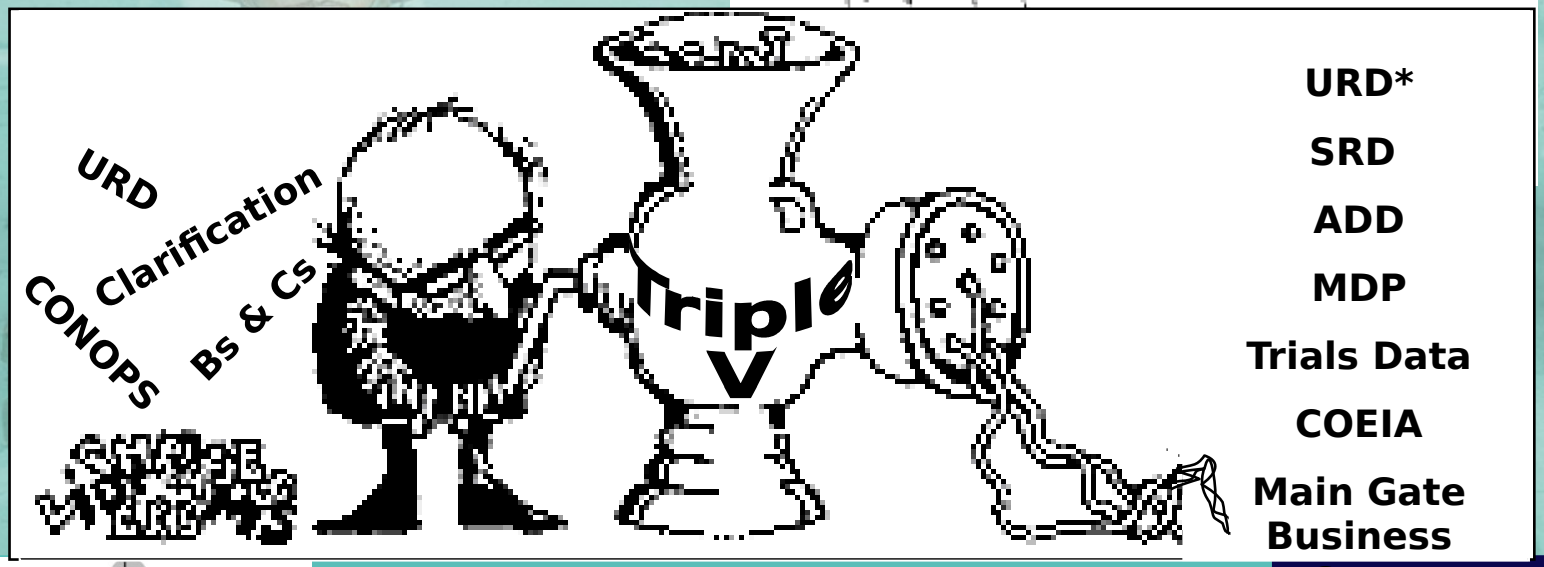
• Canada	CTS
• Sweden	Saab Warrior

Plus

- Denmark, Greece, Spain, Israel - THALES is monitoring evolving programmes

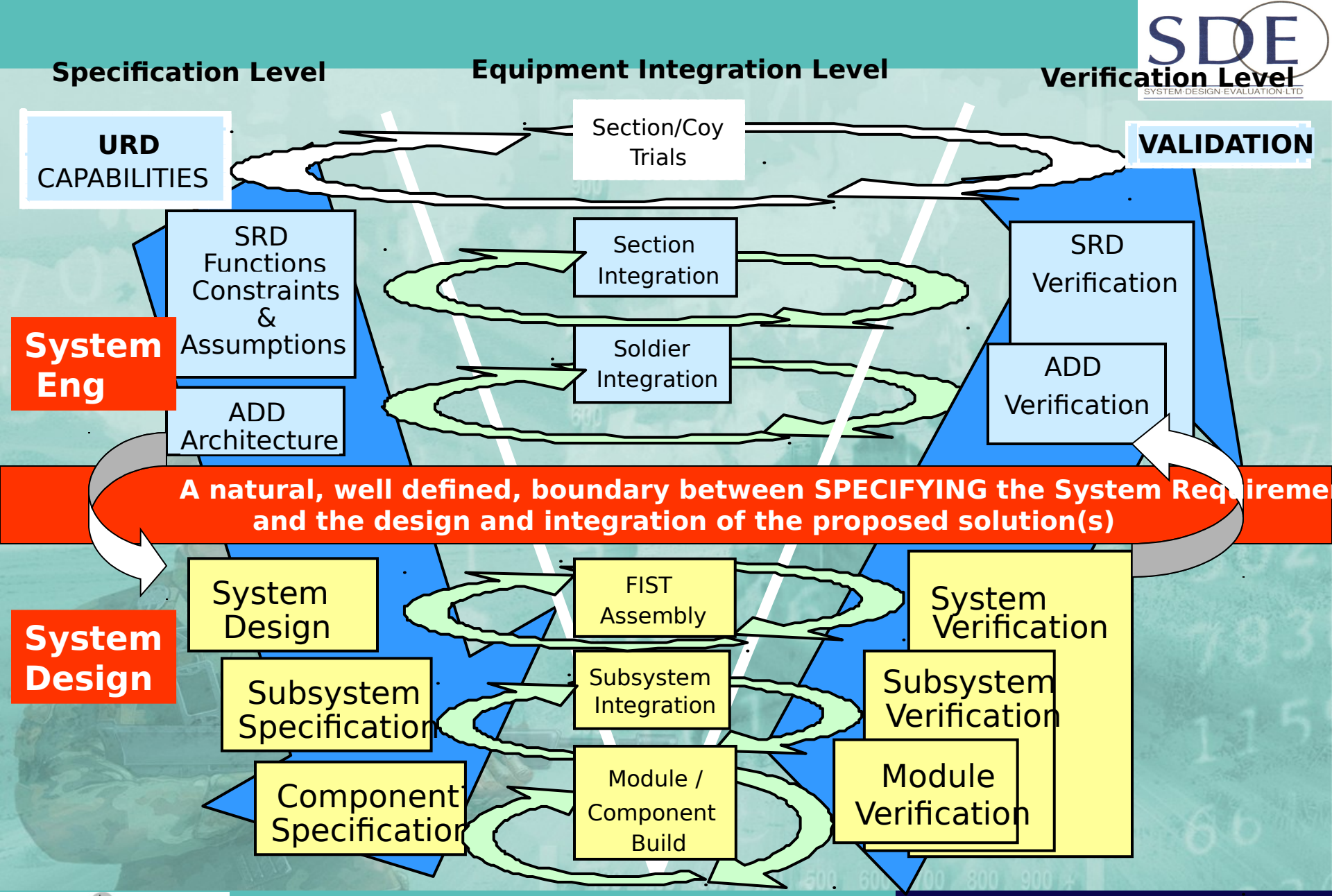
FIST Assessment Phase Process





Systems Engineering
&
Systems Design

THALES

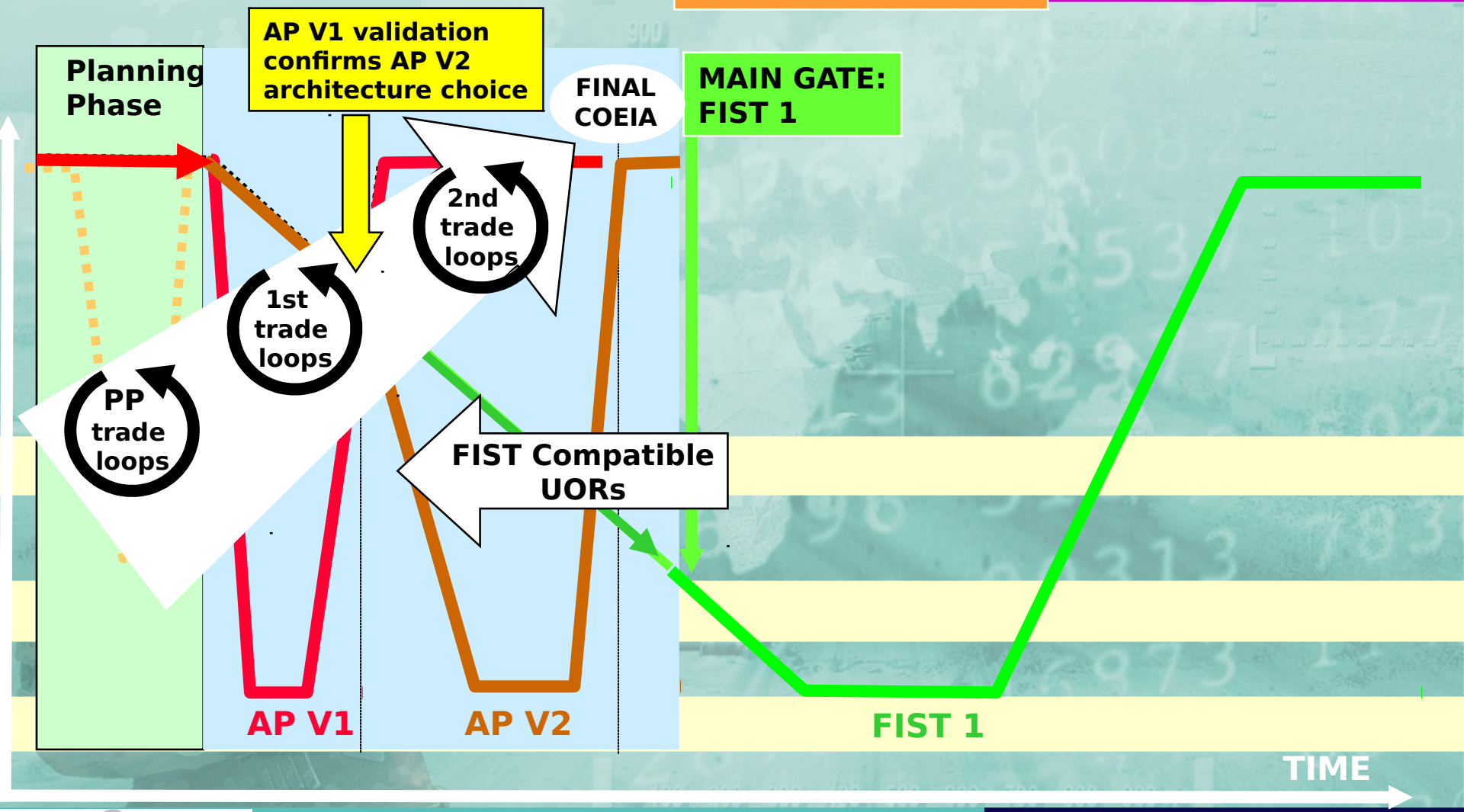

Specification Level
Equipment Integration Level
Verification Level
URD
CAPABILITIES
Section/Coy
Trials
VALIDATION
SRD
Functions
Constraints
&
Assumptions
Section
Integration
SRD
Verification
System
Eng
Soldier
Integration
ADD
Verification
ADD
Architecture
A natural, well defined, boundary between SPECIFYING the System Requireme
and the design and integration of the proposed solution(s)
System
Design
FIST
Assembly
System
Verification
System
Design
Subsystem
Specification
Subsystem
Integration
Subsystem
Verification
Component
Specification
Module /
Component
Build
Module
Verification

THALES "Triple V" FIST Methodology

FIST AP V1
Key Issues for V2 / FIST
Fast track design & h/w

Studies, Models
Analysis, Testing
Synthetic Environmen

FIST AP V2
production intent
form fit and function.

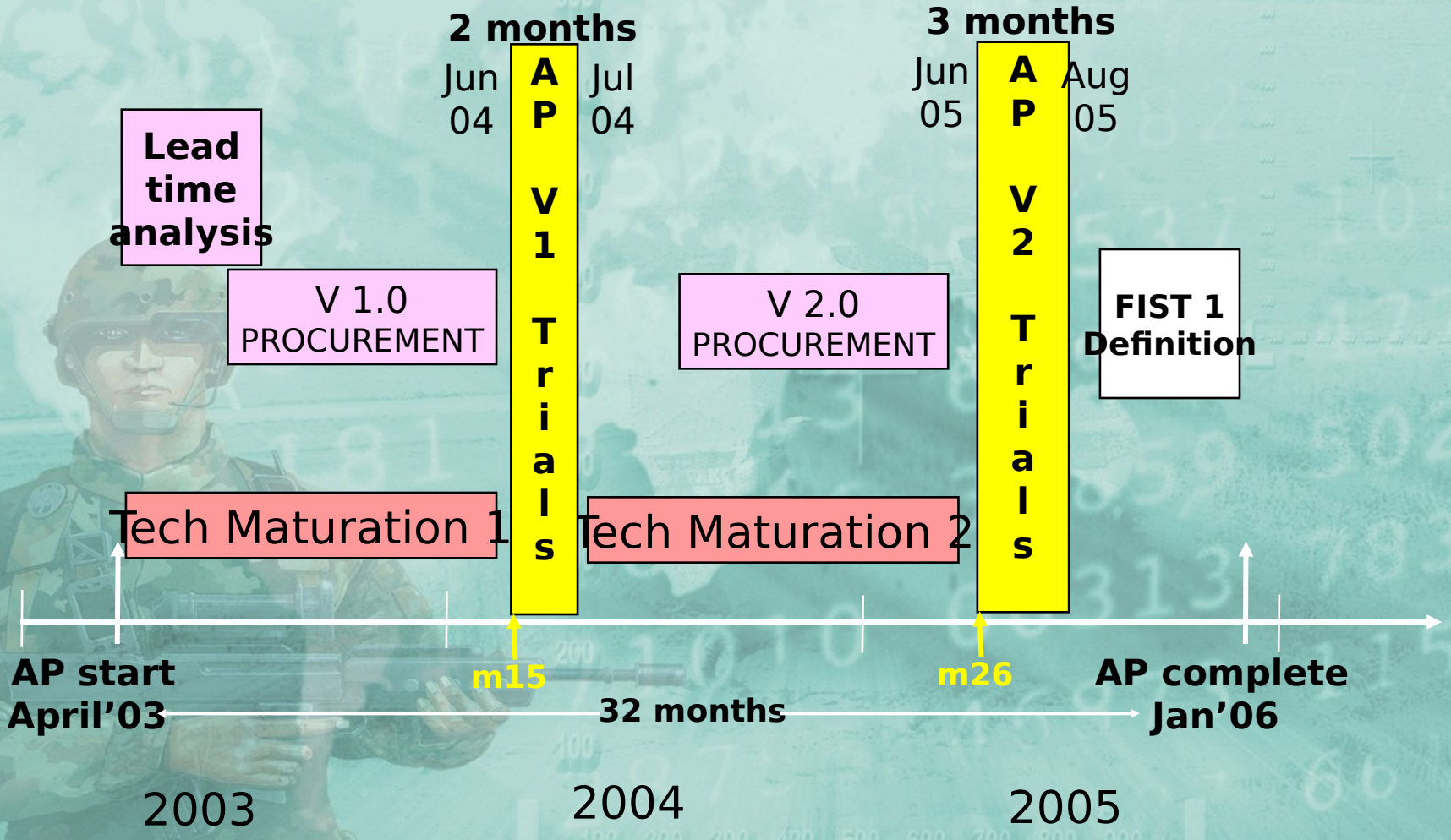


More Processes

- Risk Management
- Project Management
- Joint Project Review
- Earned Value Management System
- Learning From Experience
- Issues Management
- Supply Chain Management
- Partnering
- Trade Offs
- Assessment
- Modelling
- Technology Maturation and more.....

Assessment Phase Plan

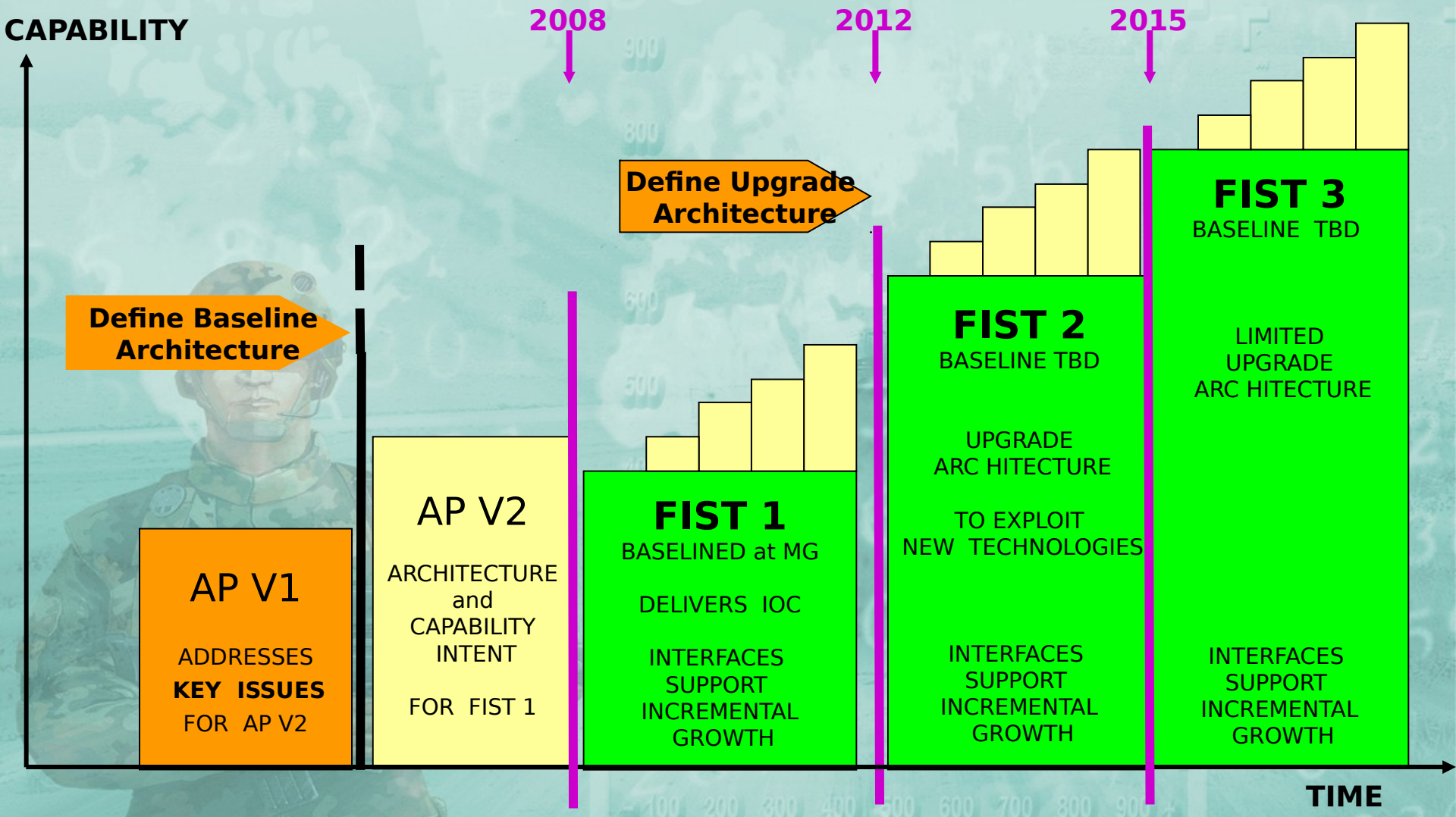
FIST 1 Timescales



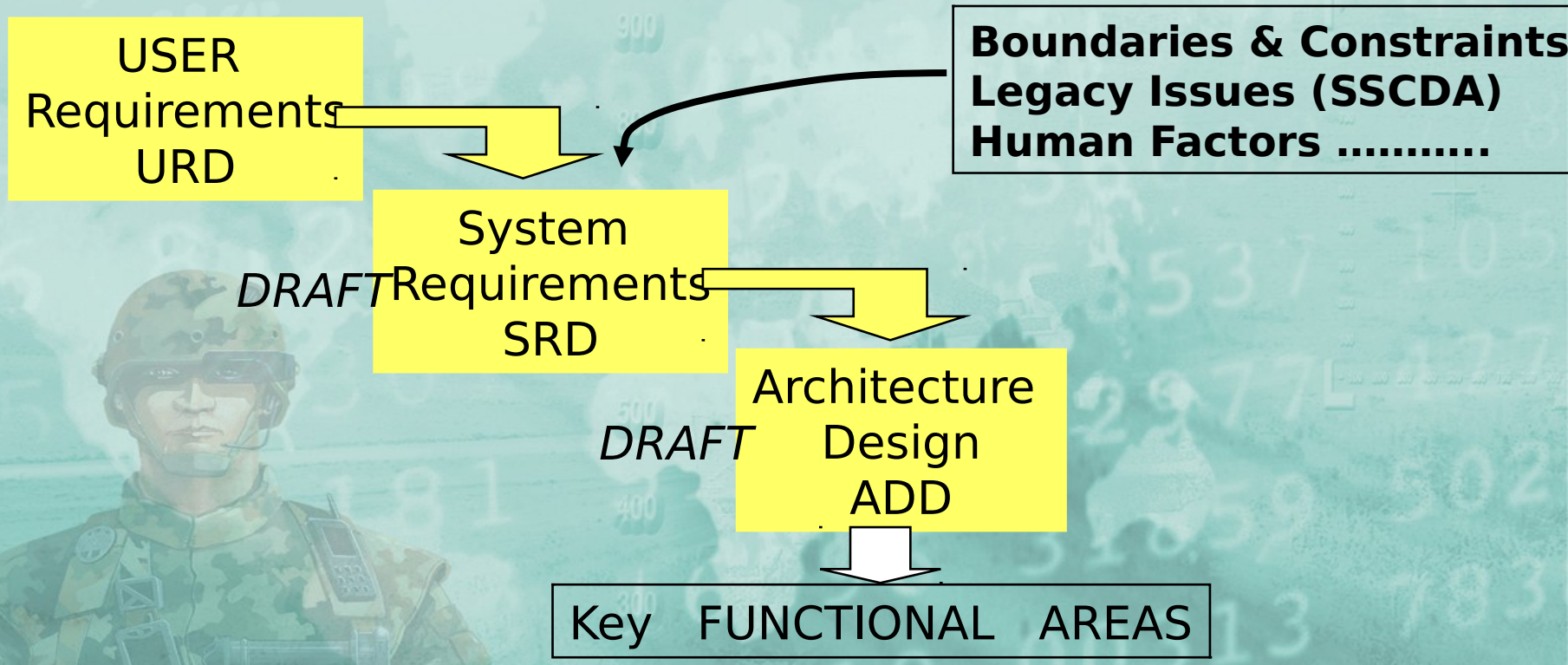
FIST 1 Trials

- AP V 1.0 Initial "Company Slice" Trials 2004
  - 2 month trials
  - Assess Architectural options
  - Initial Capability Assessments
  - De-Risk V2.0 Integration & HF Issues
  - Preliminary COEIA support data
  - Limited Quantities: Section / Platoon / Company C4I slice
- AP V 2.0 FINAL Company Context Trials 2005
  - 3 month trials - TBA
  - FINAL AP Verification & Validation Trials
  - Generate COEIA support data

FIST Incremental Procurement



What is FIST looking for ?



Infrastructure; Sustainability; Comms; Navigation
Planning; STA; Remote Sensors; Lethality; Protection

What are the major selection issues ?

Infrastructure; Sustainability; Comms; Navigat
Planning; STA; Remote Sensors; Lethality; Proto

CAPABILITY Enhancement

WEIGHT

POWER

COST - Whole Life Cost

Usability, Reliability, Trainability .....etc

WEIGHT & POWER

WEIGHT & POWER

WEIGHT & POWER

WEIGHT & POWER

WEIGHT & POWER

WEIGHT & POWER

WEIGHT & POWER

What sort of products might FIST entail ?

Infrastructure; Sustainability; Comms; Navigation
Planning; STA; Remote Sensors; Lethality; Protection

INFRASTRUCTURE
- Load Carriage
- Connectors
- Wiring Harness
- Wireless links
- .....

SUSTAINABILITY
- Batteries
- Fuel Cells
- Status sensors
- .....

COMMUNICATIONS
- PRR
- Contact reports
- Status Reports
- Sit. Awareness
- Displays
- .....

NAVIGATION
- GPS
- Inertial Nav
- map s/ware
- terrain maps
- Nav; s/ware
- .....

PLANNING
- Displays
- Image capture
- Touch Screen
- Planning s/ware
- .....

STA
- Sights
- HMDs
- NVGs
- .....

REMOTE SENSORS
- Cameras
- Acoustic sensors
- Sensor s/ware
- Sensor links
- .....

LETHALITY
- Small arms
- Sensor-Shooter
- Fire Control Systems
- Range Finding
- Direction Sensing
- .....

PROTECTION
- Helmets
- Body Armour
- Eye protection
- .....

Technology Maturation

Technology Maturation – Readiness Levels

- TRL
  - Technology Readiness Levels are defined on a nine point scale and are derived from published generic NASA and US DoD data. They have been modified to suit the FIST/DCC environment.
- HRL
  - A nine point scale has been derived for Human Factors against which the available evidence to support the HRL of the technologies and/or equipment can be rated.
- IRL
  - An equipment is Integration Ready when it conforms to all relevant logical and physical interface requirements, meets all relevant packaging constraints, and can be consistently and reliably integrated into its intended system.

Technology Maturation – the Target

- Target to align to level 7 at end of AP

Suppliers:

- Can offer equipment into test & trials - at any time
- Should be able to provide a time bound route map to higher TRLs
- Should be ready to provide valid proof of TRL achievement
- Should track the programme as tests and mini trials are ongoing almost continually
- Will need a trial report in a representative environment to achieve TRL 7. Such a trial could involve a facility such as ITDU at Warminster
- Remember - Readiness Levels allow for planned Incremental Acquisition of future Technology. The key is in the modularity of the infrastructure

Technology Categories – what are they?

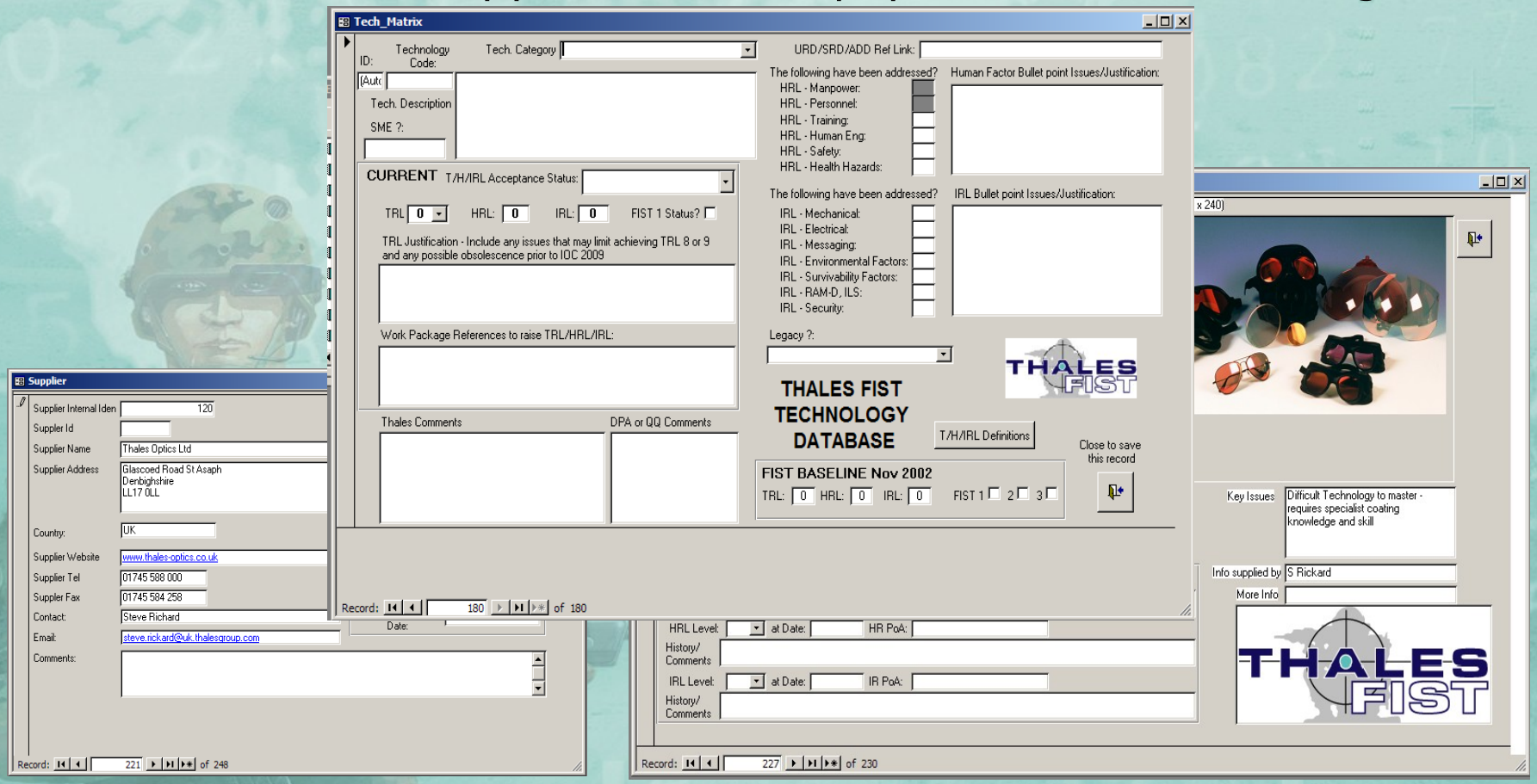
- Thales has split the SMP domain into nine Technology areas covering:
  - Infrastructure - power management, load carriage, connectors and cabling, wireless links, control devices, software based control, controller hardware
  - Lethality – Pointers, Illuminators, Range finding, azimuth/elevation sensors, ammunitions, weapons, magazines, signature reduction, non-lethal
  - Sustainability – Power sources, chargers
  - STA – II tubes, optics, II sights, Thermal Imagers, ccds, helmet display, image processing

Technology Categories – what are they?

- Navigation – GPS, compass, radio localisation, non-GPS navaids, navigation cue feedback, mapping & dead ground software
- Communications (In Contact) – Voice/Data radio transceivers, hand/wrist/lapel displays, antennae, audible warnings
- Planning (Out Of Contact) – A5 and A6 computers, touch screens, briefing/modelling software
- Remote Sensors – weapon display, data links, remoteable camera, movement detect software, ground/PIR/magnetic
- Currently in the UK FIST arena in excess of 150 technologies have so far been identified

Equipment & Technology Database (ETD)

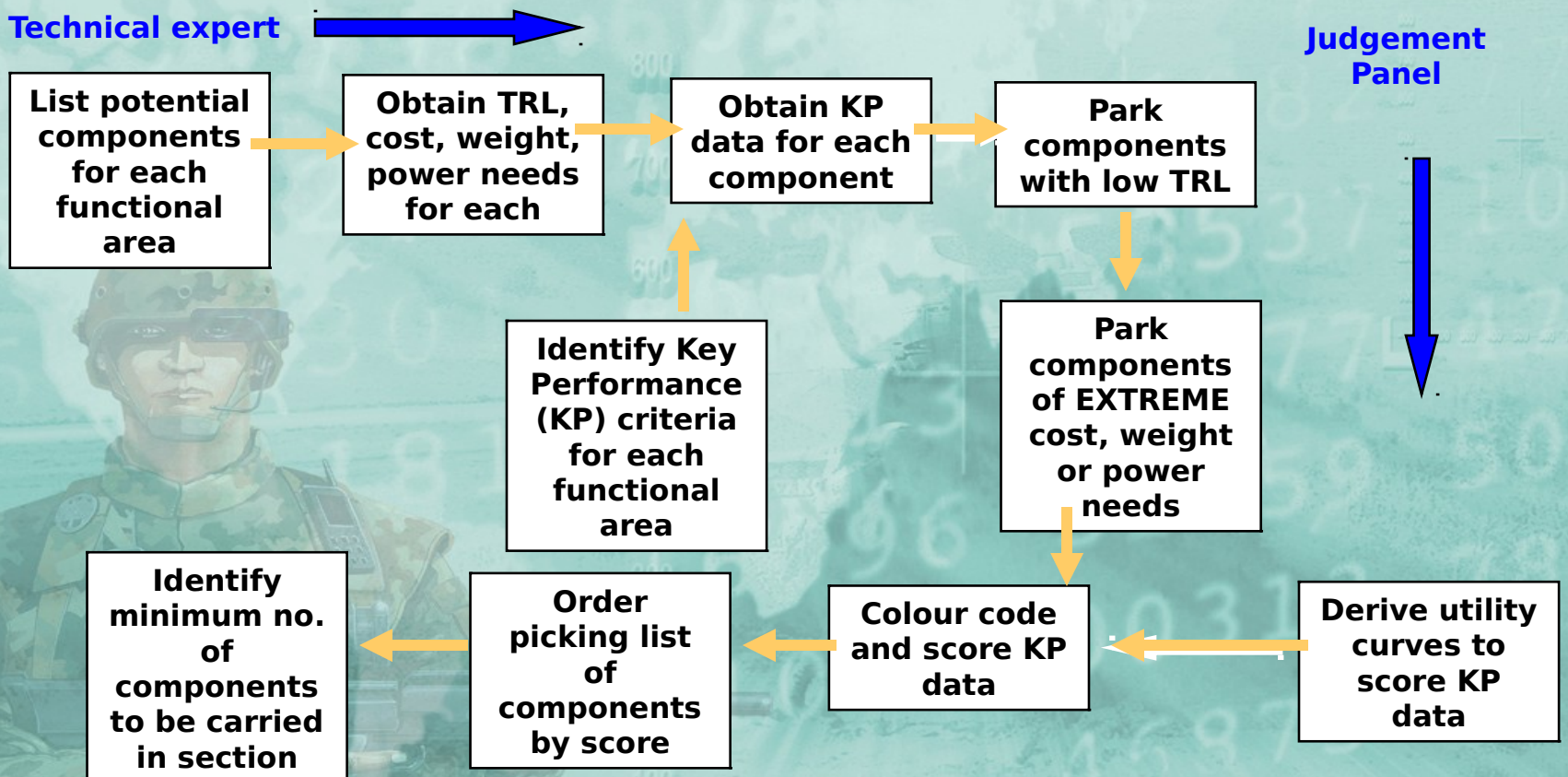
This is the database tool that Thales FIST is using to hold details on all Suppliers, their Equipment and Technologies


Tech_Matrix
Technology Code:
Tech. Category
URD/SRD/ADD Ref Link:
Tech. Description
SME ?:
The following have been addressed?
HRL - Manpower:
HRL - Personnel:
HRL - Training:
HRL - Human Eng:
HRL - Safety:
HRL - Health Hazards:
Human Factor Bullet point Issues/Justification:
CURRENT T/H/IRL Acceptance Status:
TRL 0 HRL: 0 IRL: 0 FIST 1 Status?
TRL Justification - Include any issues that may limit achieving TRL 8 or 9 and any possible obsolescence prior to IOC 2009
Work Package References to raise TRL/HRL/IRL:
The following have been addressed?
IRL - Mechanical:
IRL - Electrical:
IRL - Messaging:
IRL - Environmental Factors:
IRL - Survivability Factors:
IRL - RAM-D, ILS:
IRL - Security:
IRL Bullet point Issues/Justification:
Legacy ?:
THALES FIST TECHNOLOGY DATABASE
T/H/IRL Definitions
Close to save this record
Thales Comments
DPA or QQ Comments
FIST BASELINE Nov 2002
TRL: 0 HRL: 0 IRL: 0 FIST 1 2 3
Record: 180 of 180
Supplier
Supplier Internal Iden 120
Suppler Id
Supplier Name Thales Optics Ltd
Supplier Address Glascoed Road St Asaph Denbighshire LL17 0LL
Country: UK
Supplier Website www.thales-optics.co.uk
Supplier Tel 01745 588 000
Suppler Fax 01745 584 258
Contact: Steve Richard
Email: steve.rickard@uk.thalesgroup.com
Comments:
Record: 221 of 248
HRL Level: at Date: HR PoA:
History/ Comments
IRL Level: at Date: IR PoA:
History/ Comments
Record: 227 of 230
x 240)
Key Issues: Difficult Technology to master - requires specialist coating knowledge and skill
Info supplied by S Rickard
More Info
THALES FIST

FIST System Selection

THALES

Selection of potential components


Technical expert
Judgement Panel
List potential components for each functional area
Obtain TRL, cost, weight, power needs for each
Obtain KP data for each component
Park components with low TRL
Park components of EXTREME cost, weight or power needs
Derive utility curves to score KP data
Colour code and score KP data
Order picking list of components by score
Identify minimum no. of components to be carried in section
Identify Key Performance (KP) criteria for each functional area

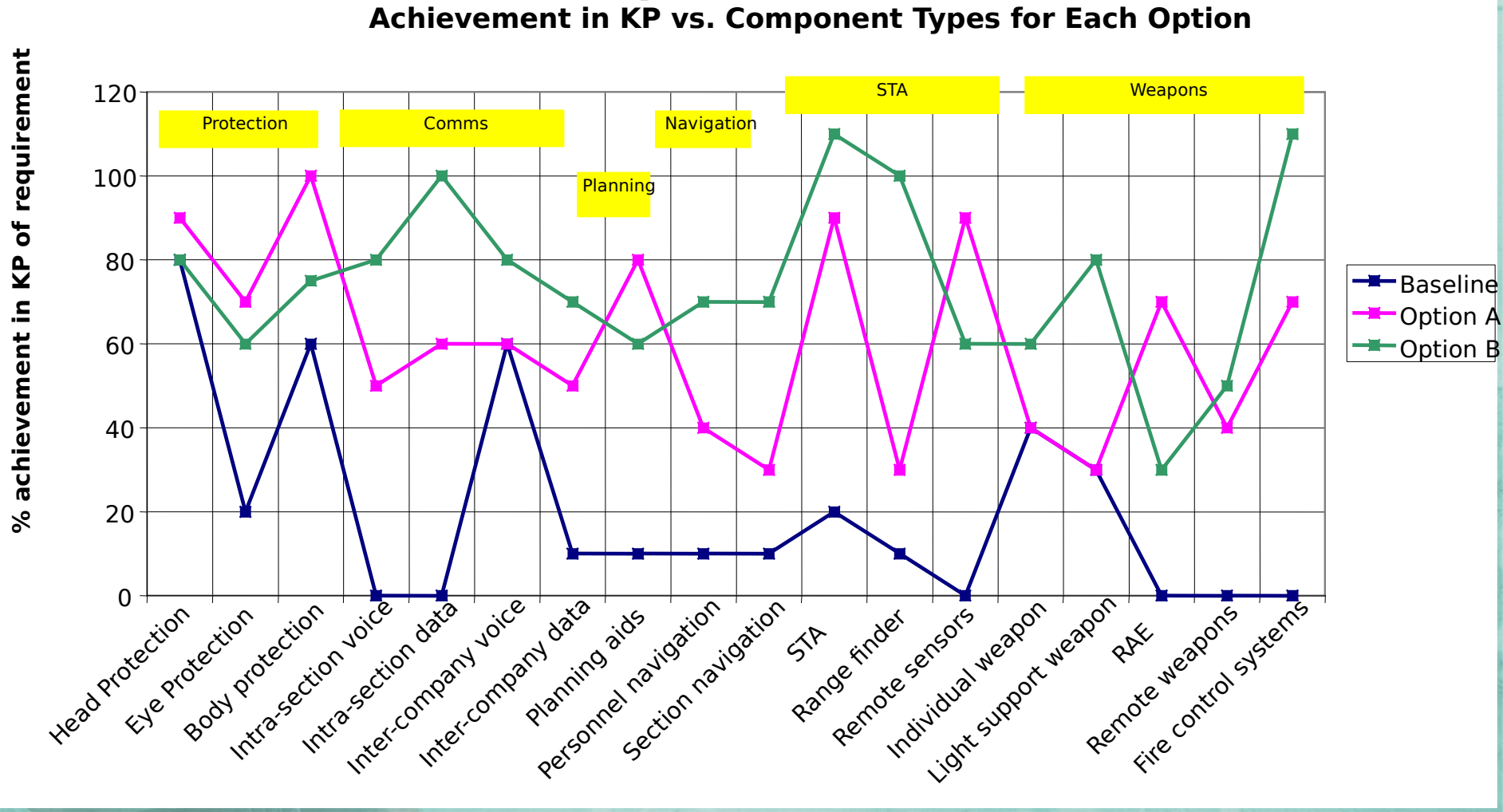
STA Components

						Key performance criteria			
	Technology Readiness Level (TRL)	Initial Cost	In service Cost	Weight (kg)	Power Usage (W)	Range to detect/locate AFVs (m)	Range to detect/locate fire team (m)	Total score	Rank order of potential options
						Target is 2500 (90% prob)	Target is 1500 (90% prob)		
Component									
Baseline				3	2	2000	1000		
Option A	7	£500	£3000	4	4	1500	750		No - performance
Option B	4	£650	£2100	3	4	1000	500		No - TRL
Option C	7	£1100	£500	5	3	2100	1100	12	3
Option D	7	£1200	£2200	10	6	2250	1000		No - weight
Option E	6	£1750	£4000	3	12	2500	1500	15	1
Option F	5	£2200	£1500	5	13	2500	1250	13	2
Option G	6	£1,800	£1500	4	13	2000	1000		No - performance
etc									

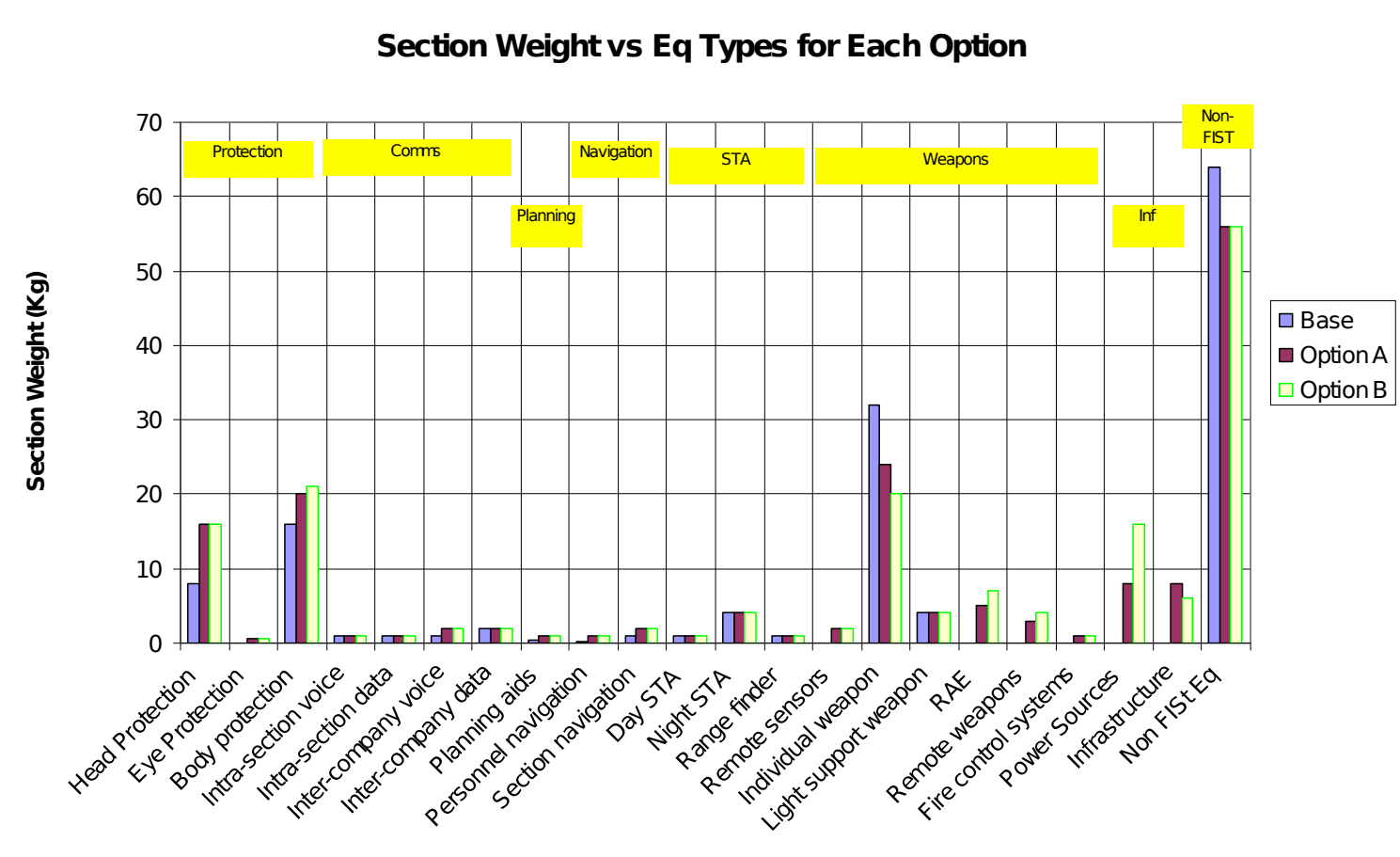
Selection of FIST systems for further assessment

•Component lists
•Function priorities
Pick components from lists in priority order
List of infrastructure equipments
Select Infrastructure Components
List of power supplies
Sum power needs for individual soldiers and select power supply. Is power supply available?
Yes
List of core equipment
Add weight of power supply and core equipments
No
Exchange equipments to reduce power
Exchange components or rebalance within section to reduce weight
No
Sum weight for each section member. Is it below 27kg average?
Yes
Exchange equipments to reduce cost
No
Sum total section cost. Is it acceptable?
Yes
Freeze candidate system
Repeat making different equipment selections
Output results graphically

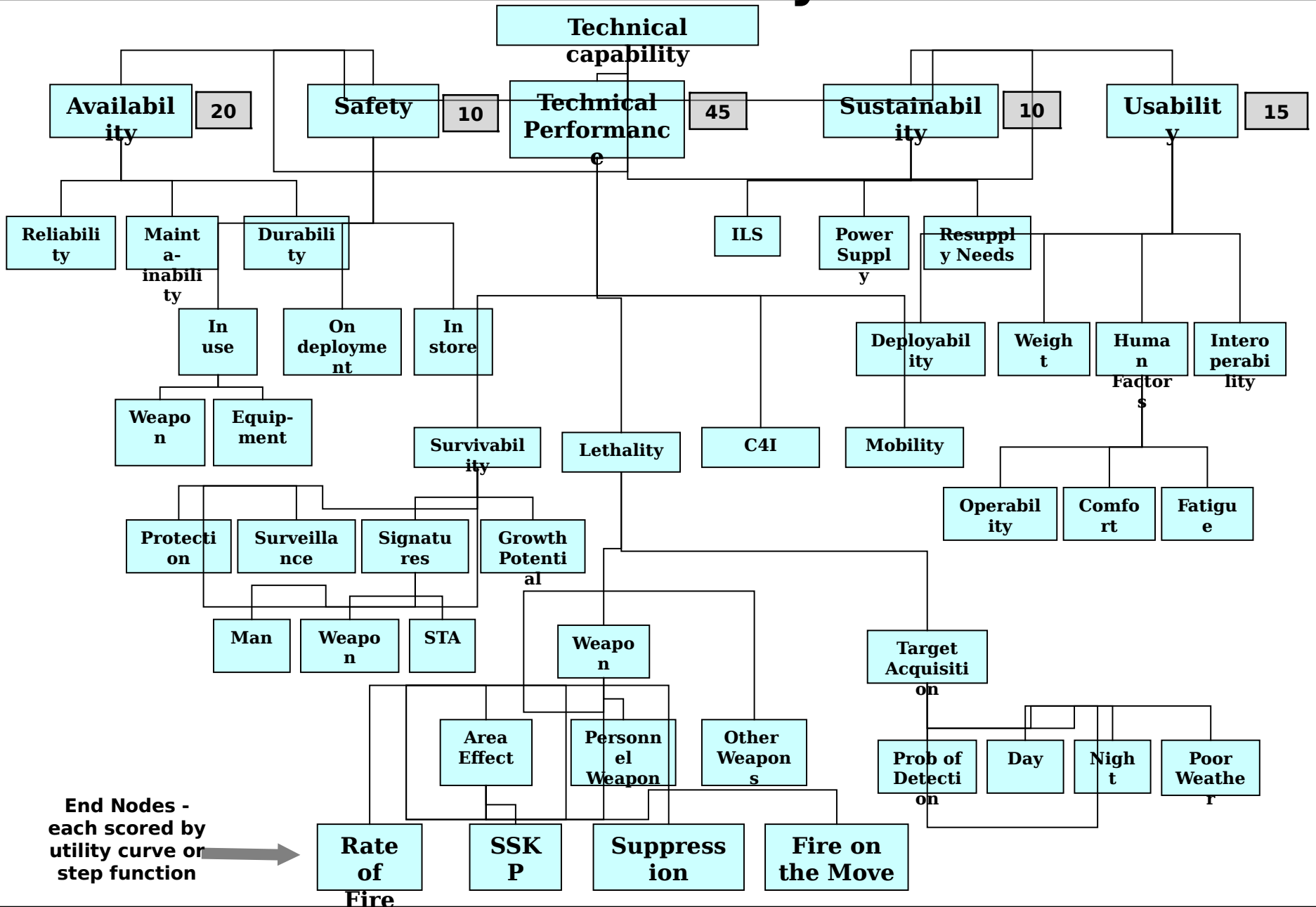
Performance comparison of FIST systems



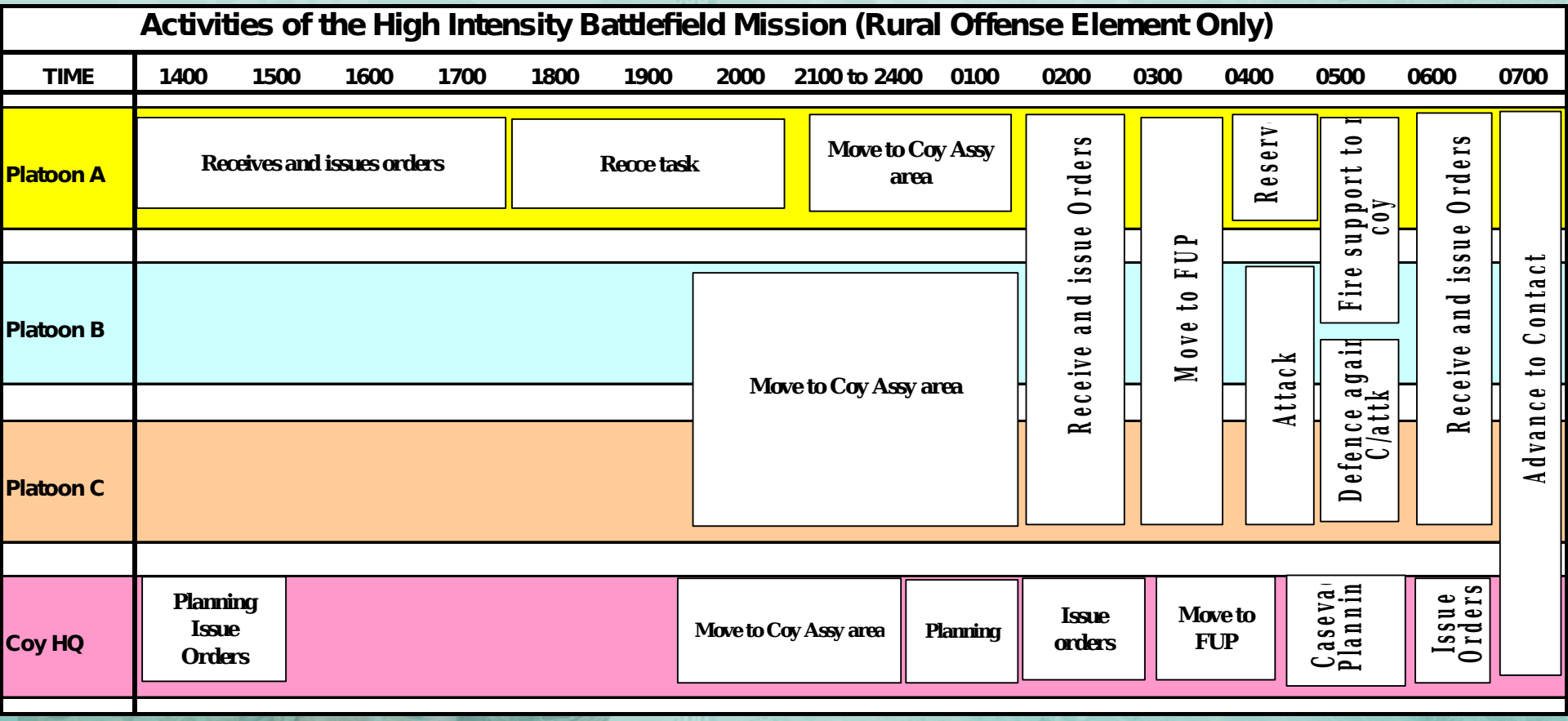
Weight comparison of FIST candidate systems



Attribute Hierarchy Process



Battlefield mission modelling



Ranking Matrix of soldier systems

Candidate System Options	Technical Assessment (AHP)	Whole Life Cost	Operational Effectiveness	Risk	Total Rank Score
M	6	1	4	2	13
P	9	3	1	3	16
C	5	9	3	8	25
D	3	5	14	6	28
A	7	6	6	9	28
I	16		8	5	29
B	4	10	11	7	32
F	12	4	16	1	33
O	1	11	9	13	34
L	17	2	12	4	35
G	13	8	5	12	38
J	14	15	2	11	42
K	2	16	15	14	47
E	11	14	7	17	49
N	10	12	13	15	50
H	15	13	17	16	61

Lethality

Lethality Programme

- Error Budget
- Studies
- Market Surveys
- Trials
- Trade Off Studies
- Modelling
- Safety

Error Budget
5.56 mm & 40 mm

- Ammunition (Basic)
- Ammunition (Fuzed)
- Range Estimation
- Weapon System_
- Sight Options
- Firer
- Firing Position
- Weapon Attitude
- Target
- Lethality/Suppression
- Meteorological Conditions

Lethality Studies

- Lethality Operational Effectiveness Study
- Lethality Survivability Study
- Lethality Tempo Study

Studies (continued)

- Azimuth & Elevation Sensor Study
- Meteorological Sensors Study
- Multi Shot GL Study
- Non Lethal Weapons Study
- PDW Study
- Round Firing Sensor study
- UGL Med Velocity Ammo
- SA80 Modification Study

Market Surveys

- Ballistic Fire Control Systems
- LRF Market
- Laser Pointer and Aimer
- 40 x 46 mm Ammo

BaselineTrials

- Baseline Trial
  - Weapons : IW, LSW, LMG, UGL
  - Sights: SUSAT, Iron, CWS & Laser Aimer
  - Modes of Fire
  - Fire Positions
  - NBC
  - Stress
- Range Estimation
  - Unaided
  - Map and compass
  - Range cards
  - GPS

Trials

- Ballistic Fire Control Systems
- Non Lethal Weapons
- Round Firing Sensor
- Med Velocity Ammo 40 x 46 mm
- Suppressors
- Dim Tracer
- PDW
- LRF/Laser Pointer/Laser Illuminator
- SA80 Modifications
- Multishot Grenade Launchers

FIST Timescales

- **FIST 1** 3 year Assessment Phase will define FIST 1 Technologies must be highly mature ¾
  Assessment Phase (AP) 2003-2005
  Version 1 Trial 2004
  Version 2 Trials 2005
  Main Gate (MG) 2006
  Initial Operating Capability (IOC) 2008/9

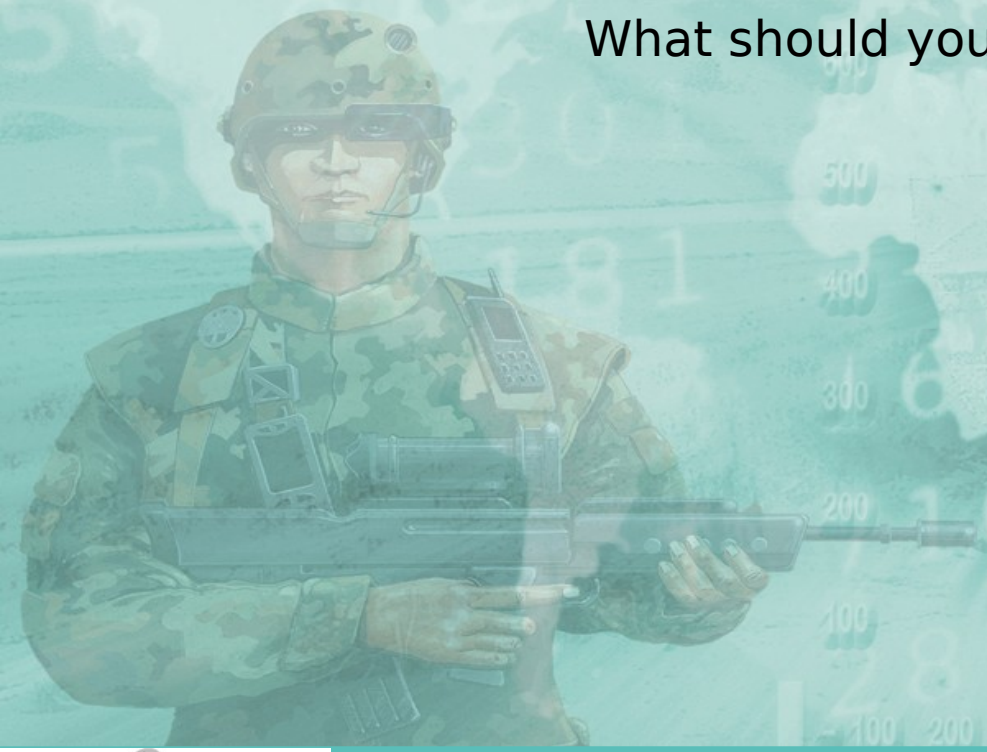
- **FIST 2** Current Applied Research Programme(ARP)
  Building on FIST 1 Capabilities
  Expectations for major C4I upgrades and ….
- **Initial Gate (IG) TBA ?**
  IOC 2012

- **FIST 3** Emerging ARP New weapon ? Further C4I ? ……
  IG TBA ?
  IOC 2015

That’s what we are doing

If you have something of interest to the UK FIST programme

What should you do?



Contact us

Keith Cook
Lethality Manager
+44 (0) 117 317 2346
Email: keith.cook@uk.thalesgroup.com
Or
Keith@SystemDesignEvaluation.co.uk

INDEPENDENT THALES FIST PCMO

Merlin House, Gifford Court
Fox Den Road, Stoke Gifford
Bristol BS34 8TT
(behind B & Q)

+44 (0)117 979 2888 www.thalesfist.com
Email: Thalesfist.suppliers@uk.thalesgroup.com